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AN ERICSSON AUSTRIA AKTIENGESELLSCHAFT

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1. Vorbescheid

FRIST: 24.1.2000

Auf Grund des Ergebnisses der gemäß § 99 des Patentgesetzes vorgenommenen Vorprüfung werden Sie eingeladen, falls die Anmeldung weiterverfolgt werden sollte, binnen **zwei Monaten** nach Zustellung des Vorbescheides sich hierüber zu äußern und

- ☐ die Einheitlichkeit der Anmeldung herzustellen (§ 88 PatG)
- ☒ die angeführten Mängel der Anmeldung zu beheben
- ☐ die in der Beilage angemarkten Korrekturen entsprechend durchzuführen
- ☒ mit Berücksichtigung der Bemängelung folgende Stücke in zweifacher Ausfertigung vorzulegen:

- ☒ neue Patentansprüche (Bezugszeichen!)
- ☐ eine Beschreibungsergänzung/neue Beschreibungsseite(n)
- ☒ eine neue Beschreibungseinleitung/angepasste Beschreibung
- ☐ ein (neues) Deckblatt (Vordruck PA 3 I)
- ☐ eine (neue) Zusammenfassung

- ☐ die vorschriftsmäßigen Zeichnungen vorzulegen
- ☒ die Erfindungseigenschaft im Hinblick auf den nachgewiesenen Stand der Technik ausführlich zu begründen
- ☐ im Hinblick auf die Intervallliteratur das Prioritätsrecht nachzuweisen (§ 95 Abs. 3 PatG)

Wird innerhalb dieser Frist weder den erteilten Aufträgen entsprochen, noch eine Äußerung oder ein Antrag auf Verlängerung der Frist überreicht, so gilt die Anmeldung als zurückgenommen. Diese Rechtsfolge tritt außer Kraft, wenn binnen vier Monaten nach Ablauf der Frist den erteilten Aufträgen entsprochen bzw. die Äußerung auf den Vorbescheid nachgeholt und eine Gebühr im Ausmaß der Anmeldegebühr auf das Postscheckkonto Nr. 5.160.000 des Patentamtes eingezahlt wird. Der Antrag auf Verlängerung der Frist unterliegt einer Verfahrensgebühr in der Höhe von 170 S (12,35 €), die nicht in Stempelmarken entrichtet werden darf, sondern auf das Postscheckkonto des Patentamtes eingezahlt werden muss. Wird ein nummerierter Erlagschein des Patentamtes verwendet, kann die Zahlung der oben angeführten Gebühren durch Überreichung der Auftragsbestätigung entweder im Original oder in Kopie nachgewiesen werden, andernfalls ist der urschriftliche Einzahlungs- oder Überweisungsbeleg vorzulegen.

Der Antrag auf Verlängerung der Frist ist stempelpflichtig.

Angeschlossen sind: Beschreibung PAZ 03751, Patentansprüche PAZ ,
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- ☐ Vordruck PA 3 I zweifach
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Ergebnis der Vorprüfung umseitig !

Österreichisches Patentamt
Technische Abteilung III
Wien, am 4. November 1999
i. V. Dipl.-Ing. Hajos

Der in der Beschreibung auf Seite 2 (Seite 1 des Beschreibungstextes), dritter Absatz, erläuterte funktionswesentliche Umstand ist aus dem Wortlaut des derzeitigen Anspruches 1 nicht ganz klar ersichtlich. Der letzte Abschnitt des Anspruches 1 wäre daher entsprechend dem nachstehenden Vorschlag zu ergänzen:

„..... mit der Übertragungsleitung (1 , 2) verbundenen Übertragungsvorrichtung (24) gesteuert ist, wobei bei Feststellung eines niedrigeren Leistungsbedarfs des Ortsteils (2) eine niedrigere Fernspeisespannung und bei Feststellung eines höheren Leistungsbedarfs eine höhere Fernspeisespannung an die Übertragungsleitung geschaltet ist.“

Weiters wären in den Patentansprüchen noch kleinere Korrekturen entsprechend den Bleistifthinweisen durchzuführen.

Ferner ist auf die WO 95/28793 A1 (British Telecommunications; 18 Seiten) zu verweisen, in der eine Schaltungsanordnung für Fernspeisung von fernmeldetechnischen Einrichtungen über die Übertragungsleitung beschrieben ist, wobei bei niedrigerem Leistungsbedarf eine niedrigere Leistung und bei höherem Leistungsbedarf eine höhere Leistung vom Amt an die Fernmeldeeinrichtung übertragen wird. Siehe insb. die Zusammenfassung sowie Seite 1, Zeile 3 bis Seite 2, Zeile 24 und den Anspruch 1 im Dokument.

Die Erfindungseigenschaft im Hinblick auf diesen bekannten Stand der Technik wäre zu begründen. Ferner wäre die Beschreibung anzupassen.

Im Hinblick auf die im Deckblatt der Beschreibung enthaltene Angabe des Herrn Kovalik als Erfinder wäre eine vorschriftsmäßige Erfindernennung einzureichen.

Nach Vorlage von im obigen Sinne überarbeiteten Unterlagen könnte mit der Fassung des Bekanntmachungsbeschlusses gerechnet werden.

<p>(51) International Patent Classification ⁶ : H04M 19/08, 11/00</p>	<p>A1</p>	<p>(11) International Publication Number: WO 95/28793</p> <p>(43) International Publication Date: 26 October 1995 (26.10.95)</p>	
<p>(21) International Application Number: PCT/GB95/00855</p> <p>(22) International Filing Date: 12 April 1995 (12.04.95)</p> <p>(30) Priority Data: 94302621.1 13 April 1994 (13.04.94) EP</p> <p>(34) Countries for which the regional or international application was filed: AT et al.</p>		<p>(74) Agent: BRADLEY, David, William; BT Group Legal Services, Intellectual Property Dept., 13th floor, 151 Gower Street, London WC1E 6BA (GB).</p> <p>(81) Designated States: AU, CA, CN, JP, KR, NZ, US, European patent (AT, BE, CH, DE, DK, ES, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE).</p>	
<p>(60) Parent Application or Grant</p> <p>(63) Related by Continuation</p> <p>US 08/251,686 (CIP)</p> <p>Filed on 31 May 1994 (31.05.94)</p>		<p>Published</p> <p><i>With international search report.</i></p>	
<p>(71) Applicant (for all designated States except US): BRITISH TELECOMMUNICATIONS PUBLIC LIMITED COMPANY [GB/GB]; 81 Newgate Street, London EC1A 7AJ (GB).</p>			
<p>(72) Inventor; and</p> <p>(75) Inventor/Applicant (for US only): LAIDLER, Graham, Anthony [GB/GB]; Forge House, Sproughton, Ipswich, Suffolk IP8 3BN (GB).</p>			

[illegible]

Where apparatus connected to a communications line is powered directly from that line it is essential that the current drawn is minimised. The present invention provides a variable power supply comprising a dc to dc conversion circuit (3) controlled by an oscillator (2). The output of the dc to dc conversion circuit (3) is used to power tone detection circuit (4) which monitors for a wake-up tone. On receipt of an appropriate wake-up tone the tone detection circuit (4) provides an interrupt signal to a microprocessor (1) which causes an increase in the oscillator frequency. The increased frequency oscillator (2) increases the power drawn from line via the dc to dc conversion circuit.

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POWER MANAGEMENT FOR LINE POWERED TELECOMMUNICATION APPARATUS

The present invention relates to apparatus for connection to a communications line and more particularly, but not exclusively, to power supply circuits for use with line powered telecommunications apparatus. The invention also relates to interrupt monitoring circuits included in such apparatus.

Telephones, particularly those with features such as amplification, are known to draw line current for powering from the telephone line. These circuits are only active when a telephone is in the "off-hook" condition and do not usually draw current when not in use.

Apparatus, such as facsimile transmission and receiving apparatus or telephone answering machines, which include monitoring circuits normally require relatively high power and include battery or mains electricity power supply sources.

As may be appreciated the 'A' and 'B' wires of a telephone line in the quiescent state have a voltage difference of approximately fifty volts d.c. in United Kingdom telephone exchanges. This voltage is provided so that a telephone line circuit in the exchange can detect looping of the line by a customer instrument by virtue of the current drawn. Such detection will occur if, say, a current of twenty milliamps or greater is drawn, but some circuits, particularly for longer lines, may be made more sensitive.

Thus if a telephone company wishes to provide line-powered apparatus, for example for telemetry applications, the current drawn from the telephone line must be less than the loop detection at lower current limit. Further, since energy consumption is not without cost, if every telephone line draws current in the quiescent state, such current draw must be minimised.

Accordingly, the present invention seeks to provide power supply circuits and interrupt monitoring circuits which have minimal current draw in the quiescent state but which

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are capable of providing higher power when required.

According to the present invention there is provided apparatus for connection to a communications line including a dc to dc converter connected to receive power from line terminals, the converter having a first lower power mode of operation and a second higher power mode of operation, the said converter powering a detector arranged for detecting the presence of a predetermined activation signal on the communications line characterised in that upon detection of such a signal the converter is switched from the first mode to the second mode to provide power to a second detector which checks the validity of the activation signal prior to permitting the connection of power to other circuits.

Preferably the dc to dc converter includes an oscillator and a transformer, the oscillator being arranged to cause dc level switching to a primary winding of the transformer such that power transfer from the communications line to other circuits occurs, the change from the first mode of operation to the second mode being effected by causing an increase in the frequency of the oscillator.

An interrupt monitoring circuit including a power supply circuit in accordance with the invention will now be described by way of example only with reference to the accompanying drawings of which: -

Figure 1 is a block schematic diagram of a part of a telemetry monitoring apparatus;

Figure 2 is a circuit diagram of the oscillator of Figure 1;

Figure 3 is a circuit diagram of the DC-DC converter of Figure 1;

Figure 4 is a circuit diagram of the tone monitoring circuit of Figure 1; and

Figure 5 is a circuit diagram of the reset circuit of Figure 1.

Referring first to Figure 1, the telemetry monitoring apparatus uses a programmed microprocessor 1 to respond to signals received over a telephone line (A,B). Most

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connections of the microprocessor 1 are not shown since they relate to functions which are not relevant to the present invention.

In the quiescent state, that is when no telemetry
5 function is taking place, the microprocessor 1 remains in a low power standby mode pending receipt of an interrupt signal at input IRQ.

A tone detection circuit 4 monitors the telephone line A, B for a designated wake-up tone (or tones). Further detail
10 of the operation of the line detection circuit may be found hereinafter.

The tone detection circuit 4 is supplied with power from a DC to DC conversion circuit 3 switching for which is provided by an oscillator circuit 2. All power for the
15 circuit 3 is drawn from the telephone line A, B by way of a bridge rectifier circuit comprising diodes D11 - D14. The bridge circuit ensures that regardless of the polarity of the telephone exchange voltage on the A and B legs of the telephone line plus fifty volt and zero volt lines are
20 consistent. The Diodes D11-D14 may be of type IN4003.

A ten ohm resistor R1 prevents excess current being drawn from the telephone line in the event of a short circuit occurring.

Referring also to Figure 2, a ten henry inductance T1
25 prevents tones on the A and B legs being sunk by the oscillator which comprises an operational amplifier, IC4, with both positive and negative feedback loops which vary the frequency of output square wave. Once the oscillator circuit 4 is running, an 8 volt line is provided from the DC-DC
30 convertor 3. However, in order to start the power supply on first connection the eight volt line is linked by a 47 k ohm resistor R12 and a 39V zener diode D15 (type BZX8-539V) to the fifty volt line. When the eight volt line is supplied from the DC-DC converter 3 as hereinafter described, the
35 diode D15 thus limits current drawn direct from the plus 50 volt supply.

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The feedback loop of the Operational Amplifier IC4 (which may be a MAX409BCPA manufactured by Maxim) comprises a ten megohm resistor R23 linked to the positive input which together with a further 10 megohm resistor R24 form a divider which causes the positive input of IC4 to follow the square wave output. The negative input of IC4 is linked to the output by way of resistors R15 and R16 respectively of one megohm and thirty three megohms. Capacitor C8 (ten microfarad) allows the negative input to follow, charging from the voltage divider chain formed from resistors R13, R14 each of 10 Megohm value between the +8 volt and zero volt lines.

Still considering the quiescent state and referring also to Figure 3, the square wave output of the oscillator 2 is fed by way of capacitors C3, C4 each of 680 picofarad value to switches Q2 and Q3. As the capacitor C3 is tied to the +50 volt line by a 220K ohm resistor R10 and the capacitor C4 to the zero volt line by corresponding resistor R11 the output square wave (which was running at approximately 200 Hz) becomes a series of positive and negative spikes of 100 micro second duration. Since capacitor C11 (of 1 nanofarad) does not have time to charge the output at the junction of the switches Q2 and Q3 switches between zero and 50 volts.

Thus a transformer T2 which has one thousand turn primary winding and three secondary windings each of one hundred and sixty six turns is caused to transfer power. Although the input is spicate, ringing through the transformer will spread the transfer. A 100 nanofarad decoupling capacitor C34 is provided to the plus 50 V line.

The first secondary winding feeds a full-wave rectifier bridge circuit comprising four diodes D7, D8 and D40, D41 which may be type BAX13 although a half-wave rectifier may be used. A capacitor C14 (ten microfarads) smooths the output which provides a normal 8 volt supply to the oscillator 2. As previously described, the eight volt line biases the diode D15 (fig 2) thus causing power for the

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oscillator to be drawn via the transformer T2 directly from the telephone line A,B.

The other two windings for the transformer T2 effectively provide a centre-tapped five volt power supply. A half-wave rectifier circuit comprising diodes D9 and D10 provides plus 2.5 V, Ground and -2.5 V lines. While the diodes D9 and D10 are type BAX13, Diodes D26 and D23 are of the zener type BZX2V7 to limit the output voltage. Capacitors C12 and C13 provide smoothing of the output which supplies power to the microprocessor 1 and tone detector 4 in the quiescent state drawing approximately five microamps from the line AB. For higher power applications it will be realized that a full-wave rectifier bridge may be incorporated.

Referring now to Figures 1 and 4, the tone detection circuit 4 comprises an automatic gain control (AGC) circuit 6, a band-pass filter 7 and a signal level detector 8.

Incoming tone signals are transferred from the 50 volt live side to the low voltage circuitry by a one to one transformer T3. Such tone signals pass to the negative input of an operational amplifier IC11 (which may be of type MAX409BCPA), the signals being biased by a one megohm resistor R2 connected to ground and a one hundred k ohm resistor R3. A 470 nanofarad capacitor C31 completes the circuit to the -2.5 volt line while preventing dc flow through R2.

Gain control is provided by a feed back loop comprising 100 k ohm resistor R4 and a one megohm resistor R5 across which diodes D5, D6 (type BAX13) are provided. The diodes D5, D6 will breakdown logarithmical if the output of the operational amplifier IC11 exceeds approximately 0.5 volts. By passing the resistor R5 thus increases the feedback bias on the negative input of the operational amplifier IC11 thus counteracting any high level output by reducing amplification of the output feed.

The gain controlled signal now passes by way of a 1 megohm resistor R27 to the band pass filter 7 and more

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particularly to the negative input of the op amp IC12 which again may be of type MAX 409BCPA). The filter comprising capacitors C15, C16 and resistors R28, R29 feed back to the input of IC12 and prevent all except a narrow band of signals around the selected wake-up tone frequency being amplified and passed to the signal level detector 8.

In a specific example if the selected frequency (f_0) is 493 Hz, C15 may be ten picofarad, C16 one microfarad and R28 and R29 each of one hundred k ohm.

Appropriate to f_0 signals pass by way of a 100 nanofarad capacitor C17 to the positive input of an op amp IC13. Biasing of the input by one megohm resistor R31 connected to the ground line and ten megohm resistor R33 connected to the -2.5 volt line to ensure that low level (or accidental) signals do not pass. A small positive feedback by resistor R33 (ten megohms) and R32 (2.2 megohms) provides some hysteresis to the circuit.

An output line IRQ is normally biased to +2.5 volts by a ten megohm resistor R35. As the op amp IC13 converts an incoming high level tone to a square wave, diode D18 is forward biased causing a falling edge to provide an interrupt signal to the microprocessor 1.

Referring again to Figure 1, the microprocessor 1 is arranged, on interrupt, to cause its output PBO to go negative. This causes resistor R18 (Figure 2) to draw current by way of a photon coupled bilateral field-effect transistor IC5 and resistor R17 thus reducing the resistor feedback to the oscillator since IC5 now provides an approximate two hundred ohm bypass of the resistor R16. Capacitor C8 and resistor chain R15, R16 causes the oscillator output to approach a saw-tooth form. The positive input of the op amp IC4 follows a low level square wave provided by the resistors R23, R24 forming a divider and the much faster rise time thus provided causes an increase in the frequency of the oscillator 2. This increases the power transferred by the transformer (T2 of Figure 3) temporarily increasing the power drawn from the telephone line A, B.

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This temporary increase in power available allows the microprocessor IC15 to carry out an accurate frequency check (approximately plus or minus one Hz) on the tone signal output from IC13 to an input TCAP of the microprocessor. If
5 the tone is no longer present or is not of the required value, the PBO output is returned to normal and the microprocessor returns to the quiescent state pending receipt of a further interrupt via IRQ.

If the signal received is a valid "wake-up" signal
10 another output (not shown) is used to cause a voltage supply rail for other circuits (also not shown) to be connected to the -2.5 volt supply by a transistor switch.

It is here noted that if power demand is maintained, the frequency of the oscillator 2 will increase as capacitor
15 C7 discharges such that the input to the transformer T2 approaches a high frequency square wave - having a period which approaches the duration of the spike output of the oscillator in the quiescent state.

For first connection or reconnection or in case the
20 occurrence of low or zero voltage for other reasons may have caused the microprocessor 1 to enter an untenable state, a reset circuit 5 (Figure 1) is responsive to rising voltage to provide a reset signal. The reset signal (received at input R15) will cause the microprocessor 1 to "re-boot" in known
25 manner.

Thus referring to Figure 5, an operational amplifier IC7 is normally held switched off by biasing provided by resistors R37 (10 megohm) R73 (5.6 megohm) and R36 (4.7 megohm). As the + and - 2.5V line voltages increase from
30 zero, diode D25 conducts causing a change in the voltage on the positive input pending re charging of capacitor C37. This causes the output of IC7 to change which change shows as a voltage edge passing through C1A causing the R/S bias (provided by way of a 10 megohm resistor R41) to change.
35 This provides the reset signal to the microprocessor 1.

It will be appreciated that the single tone detection circuit comprises of the filter 7 and level detector 8 may be

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modified to detect dual or multiple tone activation signals. Thus, for example, for DTMF type signalling a second appropriately tuned filter may be added at the output of the AGC circuit 6.

- 5 While as herein described zener diodes have been used equivalent components of the type known as silicon stabilizer diodes may be used in place thereof. The use of silicon stabilized diodes in place of zener diodes has been shown to decrease the power consumption of the circuit.

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CLAIMS

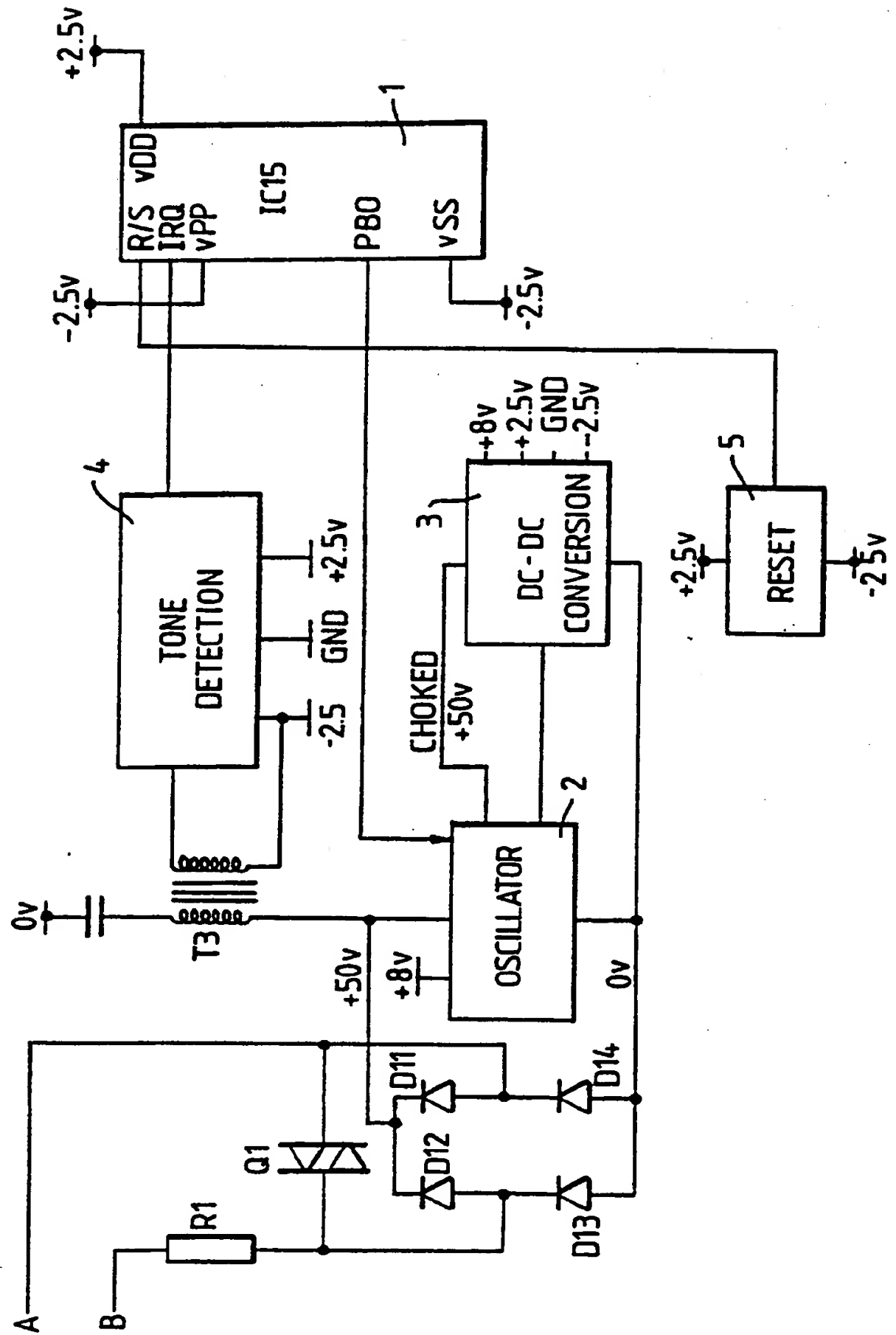
1. Apparatus for connection to a communications line including a dc to dc converter connected to receive power
5 from line terminals, the converter having a first lower power mode of operation and a second higher power mode of operation, the said converter powering a detector arranged for detecting the presence of a predetermined activation signal on the communications line characterised in that upon
10 detection of such a signal the converter is switched from the first mode to the second mode to provide power to a second detector which checks the validity of the activation signal prior to permitting the connection of power to other circuits.
- 15
2. Apparatus for connection to a communications line as claimed in claim 1 further characterised in that the dc to dc converter includes an oscillator and a transformer, the oscillator being arranged to cause dc level switching to a
20 primary winding of the transformer such that power transfer from the communications line to other circuits occurs, the change from the first mode of operation to the second mode being effected by causing an increase in the frequency of the oscillator.
- 25
3. Apparatus for connection to a communications line as claimed in claim 2 further characterised in that in the first mode the output of the oscillator is a series of positive and negative voltage spikes and in the second mode approaches a
30 square wave.
4. Apparatus for connection to a communications line as claimed in claim 2 or claim 3 further characterised in that the transformer has a plurality of secondary windings, a
35 first of which provides output power to drive the oscillator and a second of which provides output power for the detector and other circuits.

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5. Apparatus for connection to a communications line as claimed in claim 4 further characterised in that output power for the detector is drawn from a balanced pair of secondary windings.
- 5 6. Apparatus for connection to a communications line as claimed in any preceding claim further characterised in that the detector comprises gain control means, a band pass filter and a signal level detector, the signal level detector
10 providing an output signal on detection of the predetermined activation signal to cause an interrupt to be provided to a processor circuit.
7. Apparatus for connection to a communications line as
15 claimed in claim 6 when dependent on claim 2 further characterised in that on receipt of an interrupt the processor circuit causes an increase in the frequency of the oscillator.
- 20 8. Apparatus for connection to a communications line as claimed in claim 6 or claim 7, further characterised in that the detector comprises a plurality of band pass filters whereby an activation signal comprising a plurality of multi-frequency tones may be detected.
- 25 9. Apparatus for connection to a communication line as claimed in any preceding claim further characterised in that means are provided responsive to increasing power supply voltage to provide an output signal at a predetermined
30 voltage level such that circuits which may be adversely affected by low voltage conditions are reset.

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Fig.1.



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Fig. 2.

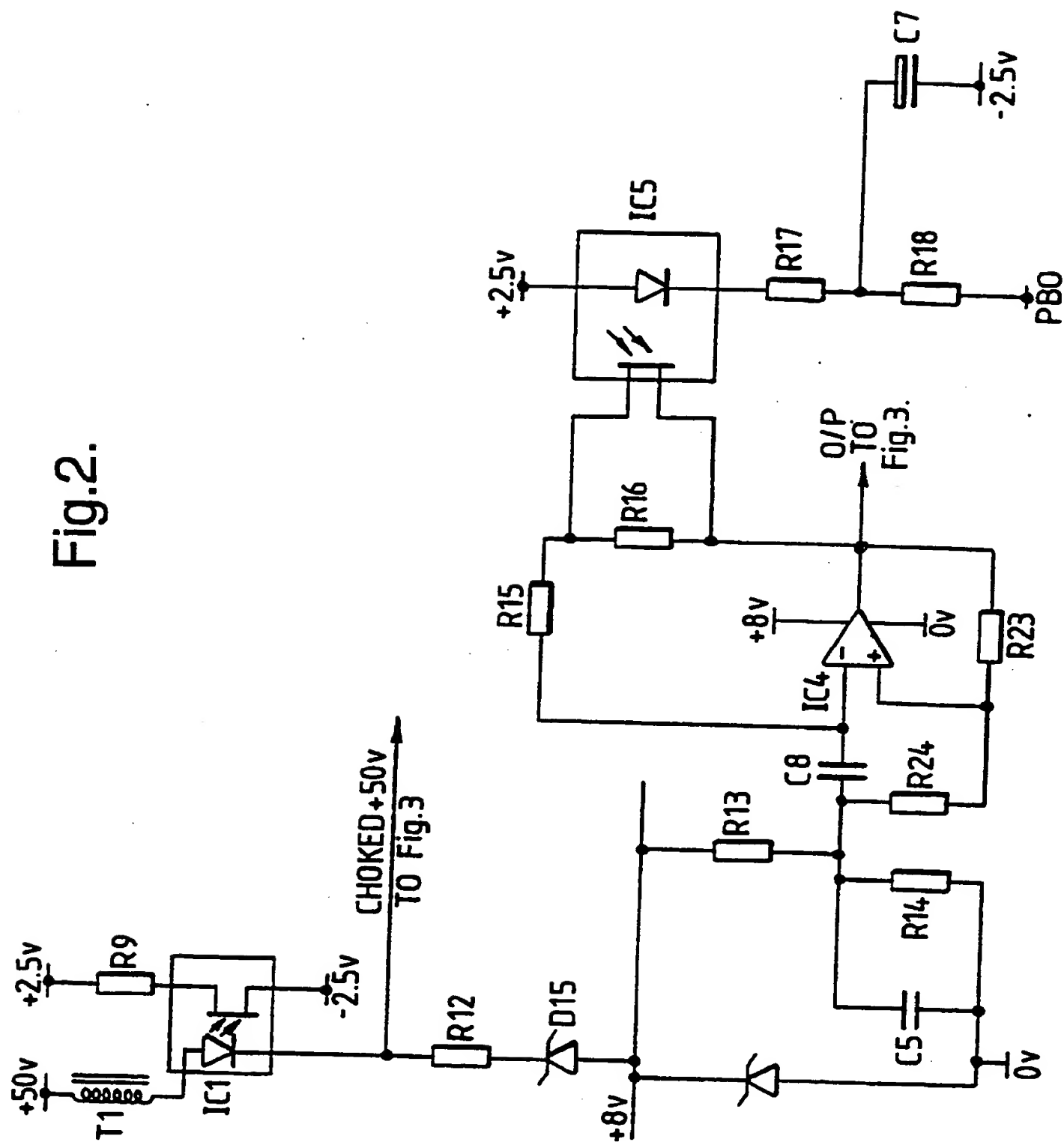
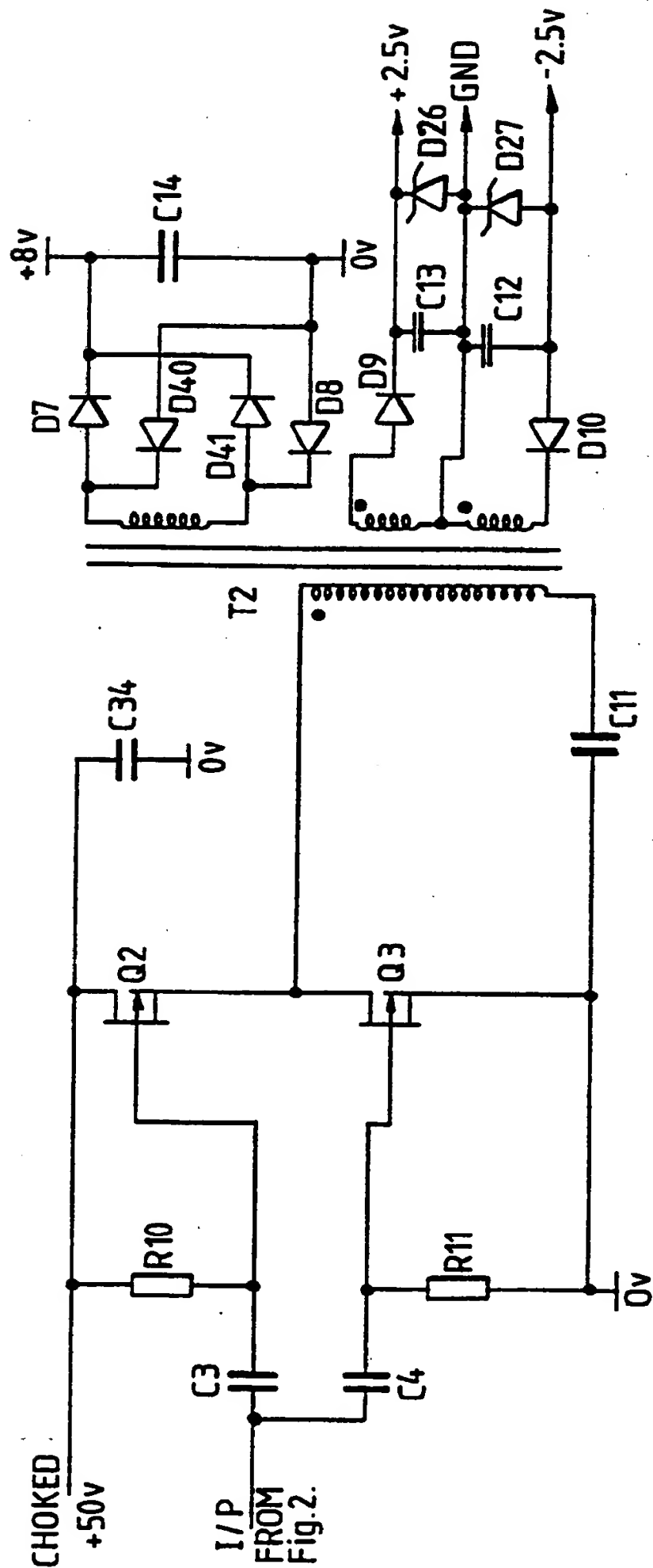


Fig.3.



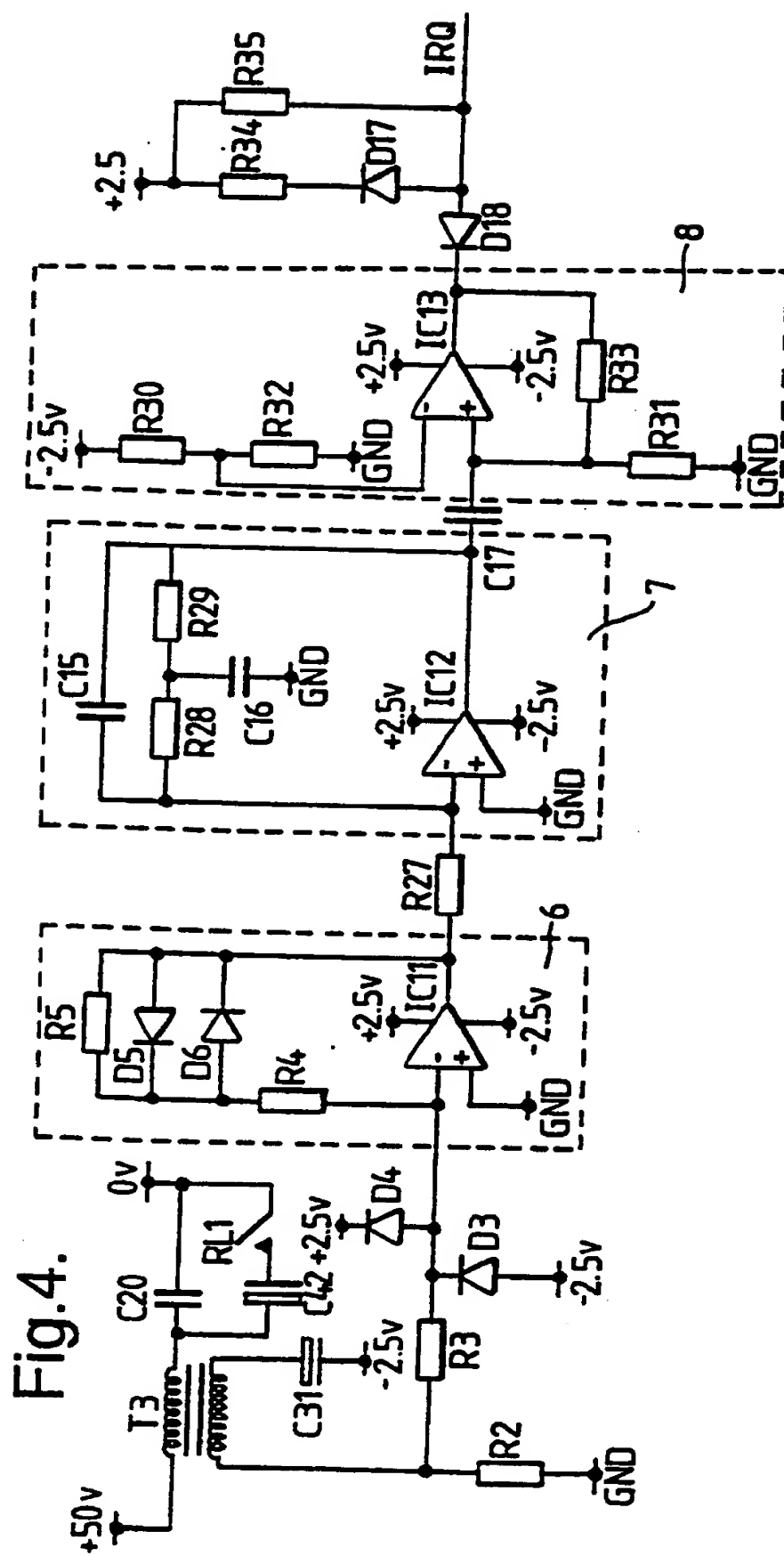
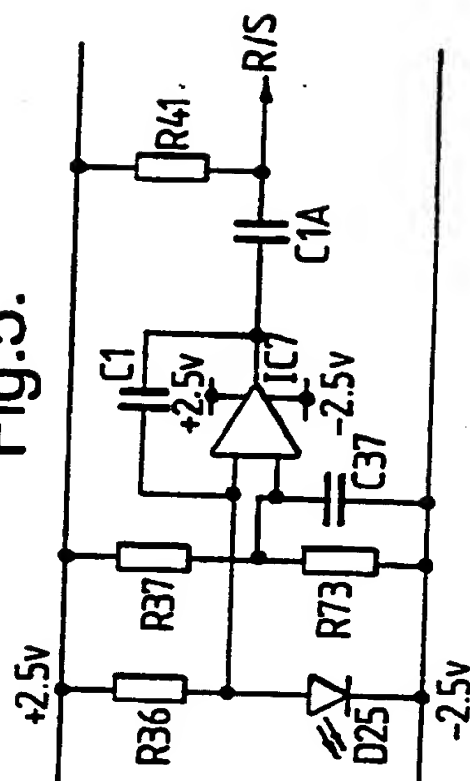


Fig. 5.



INTERNATIONAL SEARCH REPORT

International Application No
PCT/GB 95/00855

A. CLASSIFICATION OF SUBJECT MATTER
IPC 6 H04M19/08 H04M11/00

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
IPC 6 H04M H04Q

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y A	US-A-5 204 896 (OLIVER) 20 April 1993 see column 7, line 51 - line 56 ---	1 2-9
Y	WO,A,89 11194 (CANADIAN COMMUNICATIONS INNOVATIONS INC) 16 November 1989 see page 4, line 21 - line 30 ---	1
A	PATENT ABSTRACTS OF JAPAN vol. 13 no. 88 (E-721) ,28 February 1989 & JP,A,63 266956 (NEC CORP.) ---	1-9
A	EP-A-0 214 915 (INTERNATIONAL STANDARD ELECTRIC CORPORATION) 18 March 1987 see figures 6,8 ---	1-9
	-/--	

☒ Further documents are listed in the continuation of box C.

☒ Patent family members are listed in annex.

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C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT		
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A	PATENT ABSTRACTS OF JAPAN vol. 15 no. 98 (E-1042) & JP,A,02 306754 (NIPPON TELEGRAPH & TELEPHONES CORP.) 20 December 1990, see abstract ---	1-9
A	IEEE JOURNAL OF SOLID-STATE CIRCUITS, vol. 26, no. 7, July 1991 NEW YORK US, pages 1027-1032, XP 000237045 R. BECKER ET AL. 'SIGFRED: A low-power DTMF and Signaling frequency detector 237045' -----	6,8

INTERNATIONAL SEARCH REPORT

Information on patent family members

Interns Application No

PCT/GB 95/00855

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